

Missing Mass Gas Lab

Adapted from Nick Breckenfeld

Purpose: To explore limiting Reagents and Stoichiometry through combustion reaction and practice calculating percent yield.

Reaction:

Sucrose ($C_{12}H_{22}O_{11}$) reacts with potassium chlorate to produce potassium chloride, carbon dioxide, and water.

Problem/Quest:

What mass of the product is lost? What parts of the product are gases and how much mass was lost?

Pre-Lab Questions:

1. Write out the complete balanced formula for the reaction.
2. Using the balanced equation, how much potassium chlorate (MM 123g/mol) do you need to complete the reaction, assume your sucrose (MM 342g/mol) is 1.2g?
3. Write out a list of *ALL* of the products from the reaction and the theoretical *MASS* that you expect to obtain for each compound (calculate each mass based on the LR*).
4. Identify what parts of the products will be a *GAS* and calculate how much of their mass will be lost during the reaction.
5. What mass do you expect to collect at the end of the reaction (assuming you lose all compounds that are gasses...)? What will it consist of, name the compounds?

Procedures: paraphrase the procedures

1. Obtain 1 pieces of candy (sucrose, ~1.1-1.5g)
2. Use the mortar and pestle to grind sucrose into a fine powder.
3. In a new or cleaned mortar and pestle grind your calculated amount of potassium chlorate (prelab #2) into a powder of similar grain size as the sucrose.
4. Add your potassium chlorate to the sucrose in a 100-150mL beaker.
5. Add 1.0-2.5ml of ethanol alcohol and mix into a fine paste similar to consistency of toothpaste.
6. Make a small ball of your paste and let dry (2-4min).
7. Mass out a clean crucible
8. Complete the reaction in a crucible in the fume hood
 - a. Add your mixture to a crucible
 - b. In the crucible add a small amount of $KMnO_4$ (~ equal in size to $\frac{1}{2}$ raisin)
 - c. Insure the fume hood in one and the screen is at least 50% closed; carefully add a drop of glycerin to the $KMnO_4$ and with an increase of activation energy...
9. Let the sample cool, and find the mass of the solid products.



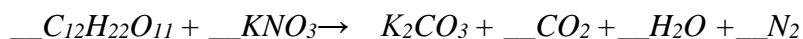
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Post-Lab Discussion Questions: (SHOW YOUR WORK,!)

1. What is the limiting reagent in reaction and why?
2. Was this what you expected? Is it more or less? Describe the outcome, what changed your results?
3. What was your percent yield for the solid collected (use your predicted mass of solid product for the theoretical mass)?
4. What was your percent yield for the gasses (you have two of them and they went into the atmosphere not your crucible)?
5. Was this what you expected? Is it more or less? Describe the outcome, what changed your results?
6. *What would be your limiting reagent if you had 100kg of sucrose and 98kg of potassium?*
7. *Rewrite and balance the formula, but replace potassium chlorate with sodium chlorate.*
8. *How many grams of sodium chlorate would you need to complete the reaction, using the Same quantity of sucrose? Is it more or less than the quantity you used in the original reaction? Explain Why!*
9. *How many grams of sucrose would you need to create 1.0 liter of water?*
10. *What was the total mass of the products vs. the total mass of the reactants? Add all of the masses of the compounds on each side of the equation.*
11. *How many grams of sucrose will you need to produce 1.0kg of potassium carbonate? What would be a way you could test for the carbonate ion?*



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